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ABSTRACT

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A REGRESSION MODEL FOR SELECTION OF GAMES TO ENHANCE PROBLEM SOLVING AND PERSONALITY SKILLS IN YOUNG CHILDREN

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This study reports the results of research on analyses of game difficulty. Predictor variables were number of rules, spaces, and pieces necessary to play a game. Criterion variables were related to the child's ability to play successfully, and numbered eight. Data were subjected to multiple regression analysis, leading to the conclusion that it is feasible to predict the appropriateness of a game for providing practice in specific skill areas from physical descriptors of the game.

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A REGRESSION MODEL FOR SELECTION OF GAMES TO ENHANCE PROBLEM SOLVING AND PERSONALITY SKILLS IN YOUNG CHILDREN[1]

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For the past several years, the Southwest Educational Development Laboratory has been exploring the utilization of informal classroom situations to enhance learning in children aged 5 through 8. One phase of the research dealt with the potential for rule-governed games to promote increases in two skill areas related to problem-solving, the cognitive area and the affective area.

Four categories of games were used in the study: (1) construction games like Tinkertoys, (2) chance games like Winnie the Pooh, (3) chance-strategy games like Parchessi, and (4) strategy games like Checkers. The different kinds of games pose different kinds of behaviors for the child: cognitive - to find a piece that will fit to complete a construction, or a move that will win a game; and affective - to persist to the completion of a game, or to learn to take turns.

This paper reports the results of preliminary research on the prediction of game difficulty from three physical descriptions of the games: number of spaces, rules, and pieces need to play.

PERSPECTIVE

Empirical studies on the effects of games yield support for using games to increase analytic thinking and problem-solving skills. According to various researchers, games can teach decision-making skills (Inber, 1970; Coleman, 1969), encourage individual goal-oriented behavior (Coleman, 1969; Micheman, 1974), increase the number of adaptive responses a child can make (Flesher,

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1970), promote reflective thinking strategies, and help to fix a child's new logical abilities, preventing the child from losing them (Piaget, 1962). Each of these skills can be considered an important part of the problem-solving process. Avedon and Sutton-Smith (1971), believe that games may make the following demands on the players: figural, symbolic, semantic and behavioral cognition, memory, divergent and convergent production, and evaluation. Preliminary research by Kennedy and Newman (1976) tentatively suggests that the cognitive operation of evaluation may be increased by games experience.

Other studies of interest include those which explore the affective benefits of learning with games. Shannon (1974) emphasizes that playing with rule-governed games offers children the chance for self-discovery and developing self-confidence. Piaget (1962) expects game playing to increase interpersonal skills since individuals learn to operate with rules imposed by a group. Coleman (1969) applauds games as opportunities for children to learn in their natural ways - through observation and imitation. When playing games, older children, adults, or more skilled children inadvertently model actions and thoughts to the other players. Roberts and Sutton-Smith (1967) found that personality characteristics are correlated with success in strategy games.

The few studies that have been reported indicate that games may be an effective learning tool for children, particularly with the cognitive and affective skills associated with problem solving.

METHOD

For purposes of this investigation, three predictor variables were identified. They were: (1) number of distinct rules necessary for playing the game correctly, (2) number of separate pieces (including the board) and (3) number of spaces constituting the playing surface. (e.g., 64 for checkers.) These

descriptions were obtained for a total of 12 commercially available children's games.

Eight criterion variables were identified as being potentially influential in a child's ability to play the games successfully. These variables were of two basic types: analytic thinking skills and personality variables. The analytic thinking skills were further subdivided into problem solving, observation, prediction, and flexibility dimensions. Personality attributes were subdivided into four variables: persistence, tolerance of frustration, curiosity, and concentration. Each game was rated by a panel of learning theorists and researchers utilizing a Likert scale, as to the importance of each of the eight variables for successful play of the game. Each of these terms is defined below.

1. Observing: When children develop and use the observation process, we refer to it as a skill. The process can be learned. The process of observing includes (1) consciously looking for properties of objects such as dimensions (size, shape, color), structural characteristics (parts, lines, holes), and details about actions and events, (2) actively examining objects by looking and touching.

2. Predicting refers to the process used by a person in determining an outcome of a specific action which has not yet taken place. When children develop and use the process involved in making predictions, we refer to it as a skill. The process can be learned. The process of predicting includes (1) observing and determining information relevant to making a prediction, (2) picturing or imagining an outcome before the action is performed.

3. Inferring refers to the process used in determining a cause when shown an effect. The process of inferring includes seeking information by observing the relevant aspects of the situation in order to determine the cause.

4. Flexibility refers to the process or processes used by a person in creating a novel use for an object, or in changing tactics or strategy in playing a game.

5. The Thinking and Reasoning Program has identified four basic steps in the problem solving process:

a. Identify the problem.
b. Determine relevant aspects of the problem for situation.
c. Generate solutions.
d. Test and evaluate solutions.

6. Persistence: Continuing without change until a task is completed.

7. Toleration of Frustration: Enduring or adapting to an unfavorable environment; resistance to discouragement arising from unresolved problems.

8. Curiosity: Interest leading to inquiry; the desire to investigate.

9. Concentration: Direction of attention to a problem in spite if distraction.

RESULTS

Data on the 12 games were subjected independently for each criterion variable, to a series of multiple regression analyses. The following statistics were generated: the simple correlation coefficient and Beta weight for each predictor variable in relation to each criterion variable, proportion of variance accounted for by the predictors, multiple correlation coefficient for the three combined predictors, and the regression constant. As revealed in Table 1, the multiple correlation coefficients obtained from the combined three predictor variables were generally quite high. Only for two variables (observation and toleration of frustration) were the coefficients lower than .73; the highest multiple correlations were those with the criterion variables of problem solving (.80) and curiosity (.87). The magnitude of the correlations was similar for cognitive and for personality related criterion variables.

IMPLICATIONS

From these findings, the authors conclude that it is potentially feasible to predict the appropriateness of a new game for providing practice in specific

skills domains from physical descriptors of the game. Further studies in which additional descriptors are employed, and validity checks using other games are in progress.

TABLE 1

Prediction of Analytic and Personality Skill Associations
Based on Physical Descriptions of Children's Games

Criterion Variable	Simple r					Beta Weights			
	Rules	Pieces	Spaces	R^2	R	Rules	Pieces	Spaces	K
Analytic Skills									
Problem Solving	.19	.58	.68	.64	.80	-.09	.03	.03	.82
Observation	-.03	.20	.45	.33	.58	-.09	.00	.02	2.15
Prediction	.08	.65	.54	.60	.77	-.11	.05	.02	1.00
Flexibility	.26	.40	.74	.61	.78	-.08	.01	.04	.84
Personality Skills									
Persistence	.64	-.06	.56	.55	.74	.10	-.02	.01	1.79
Toleration of Frustration	.21	-.21	.42	.35	.59	-.01	-.03	.02	2.19
Curiosity	.11	.73	.61	.75	.87	-.05	-.02	.01	1.11
Concentration	.21	.15	.68	.53	.73	-.06	-.01	.03	1.74

Note: Criterion variables were scaled from ∅ (no requirement) to 3 (highest requirement).

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